UNIVERSITY
OF WARMIA AND MAZURY
IN OLSZTYN

Faculty of Mathematics and Computer Science

Course title: FOUNDATIONS OF LOGIC AND SET THEORY

ECTS credit allocation (and other scores): 5

Semester: autumn

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English

Number of hours per semester: 30 lectures + 30 classes = 60 hours

Course coordinator/ Department and e-mail: Erasmus coordinator Anna Szczepkowska/ WMiI, anna.szczepkowska@matman.uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES:

1. Propositional calculus. The method of checking if the formula is the tautology of propositional calculus. 2. Correct rules of propositional calculus. 3. The method of analytic boards for propositional calculus. 4. Conjunctive normal form and disjunctive normal form of formulas. 5. Axiom system for propositional logic- the examples of proves. 6. First order logic. Axiom system for predicate calculus- examples of proves. 7. The algebra of sets. The basic laws of the algebra of sets. 8. Relations. The basic laws for relations. Checking the properties of relations. 9. Functions as relations. 10. Equivalence relations. Relations of equivalence examples. Equivalence classes. 11. Ordered sets. Ordered relations. Examples. 12. The cardinality of sets. Cardinal numbers. Countable infinite sets. Continuum sets. Examples.

LECTURES:

1. Short historical outline of logic and set theory. Propositional calculus. The operators, the formulas, the tautologies. 2. Correct rules of propositional calculus. Definition of substitution. Substitution theorem for propositional logic. 3. Axiom system for propositional calculus. 4. First order logic. 5. Axiom system for predicate calculus. 6. Set theory-the introduction. Axiomatic set theory-Zermelo Axioms. 7. Algebra of sets. 8. Relations. Functions as relations. 9. Equivalence relations. Equivalence classes. A theorem about equivalence classes. 10. Ordered sets. Ordered relations. 11. The cardinality of sets. Cardinal numbers. Countable infinite sets. Continuum sets.

Learning purpose:

The introduction with basic notions and the mathematical tools, introduction of fundamental mathematical objects and description of their properties, acquiring the skill of applying the propositional calculus and the quantifiers in leading the argumentation, particularly in theorems argumentation.

On completion of the study programme the graduate will gain:

Knowledge:

has the basic knowledge in the field of logic and set theory, knows the illustrating examples of acknowledged notions in logic and set theory.
well understands the role and the importance of proof in mathematics, and also the notion of the significance of assumptions.

Skills:

possesses the skill of applying the propositional calculus and the quantifiers in leading the argumentations, particularly in argumentation of the theorems.
is able to use correctly the quantifiers in different disciplines of mathematics, and also in colloquial language.
uses the language of set theory, interpreting questions from different areas of mathematics.
is able to get the information from literature, to work over set questions individually and in a group.

Social Competencies:

is able to work collectively over solution of given task or problem, to think and to act in enterprising way.

Basic literature:

1) J.Słupecki, K.Hałkowska,K.Piróg-Rzepecka, Logika matematyczna, 2) A.Wojciechowska, Elementy logiki i teorii mnogości, 3) H.Rasiowa, Wstęp do matematyki współczesnej, 4) K.Kuratowski,A.Mostowski, Teoria mnogości, 5) W.Marek,J.Onyszkiewicz, Elementy logiki i teorii mnogości w zadaniach,
Supplementary literature:
1) A.Błaszczyk,S.Turek, Teoria mnogości, 2) T.Batóg, Podstawy logiki, 3) B.Stanosz, Ćwiczenia z logiki,

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The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 2,52 ECTS points,

Student's independent work: 2,48 ECTS points,